

REMARKS

In view of the above amendments and following remarks, reconsideration and further examination are requested.

Attached hereto is a marked-up version of the pages of the claims to which changes have been made by the current Amendment. The attached pages are captioned **"Version With Markings To Show Changes Made."**

By the current Amendment, each of the independent claims 39, 52 and 58 have been amended, and new claims 89-93 have been added.

Each of the independent method claims, i.e. claims 39 and 52, now recite

softening to flow up to an edge of said electronic component, and then hardening, with heat, said thermosetting resin interposed between said electronic component and said circuit board.

Similarly, independent apparatus claim 58 now recites

a heating device to soften to flow up to an edge of the electronic component, and then harden, with heat, the thermosetting resin interposed between the electronic component and the circuit board.

Support for the amendments to claims 39, 52 and 58 can be found on page 30, lines 8-13 of the original specification.

Since the solid thermosetting resin is first heated to be softened, the resin can surely flow up to the edge of the electronic component to improve sealing reliability.

To the contrary, in Murakami, since the sealing resin is liquid already having fluidity, it is not necessary to heat the sealing resin so as to soften it for flowing up to an edge of an electronic component. Accordingly, Murakami fails to teach or suggest that a solid thermosetting resin is heated to be softened so as to allow the resin to flow up to an edge of an electronic component, as now recited in each of the independent claims.

Accordingly, each of independent claims 39, 52 and 58 is not anticipated by Murakami. For analogous reasons, these claims are also not anticipated by DE '282.

Gruppen-Shemansky et al., Tsukagoshi et al. '542 and Matsubara et al. do not resolve the above deficiencies of Murakami and DE '282, and accordingly, each of claims 39, 52 and 58 is allowable over any combination of these three references and either of Murakami and DE '282.

Each of new claims 89 and 90 is believed to be patentable in its own right for the following reasons. These claims each recite that a heated bonding tool holds the electronic component while the electronic component is being aligned with the circuit board, that the heated bonding tool transfers heat therefrom to the thermosetting resin to soften the thermosetting resin, and that the heated bonding tool forces the electronic component against the thermosetting resin to achieve mutual pressing between the electronic component and the circuit board. Support for these claims can be found on page 27, beginning at line 11 of the original specification, for example.

Because the electronic component is held by a heated bonding tool, the electronic component is heated such that any warpage of the electronic component is easily corrected, and heat can be transferred to necessary portions of the circuit board via the electronic component when pressed against the circuit board.

To the contrary, Murakami and DE '282 fail to teach or suggest a heated bonding tool as recited in claims 89 and 90. Additionally, the remaining references relied upon by the Examiner fail to teach or suggest the use of a heated bonding tool as recited in claims 89 and 90. Accordingly, each of claims 89 and 90 is patentable in its own right over any possible combination of references relied upon by the Examiner.

Furthermore, each of new dependent claims 91-93 is also believed to be patentable in its own right because these claims recite that the solid thermosetting resin includes an inorganic filler. Support for these claims can be found on page 27, lines 1-4 of the original specification, for example.

The inclusion of an inorganic filler in the solid thermosetting resin can increase the modulus of elasticity of the resin so as to decrease the resin's rate of thermal expansion, thereby resulting in improved bonding reliability.

None of the references relied upon by the Examiner teach or suggest a solid thermosetting resin including an inorganic filler, and accordingly, each of claims 91-93 is patentable in its own right over any possible combination of the references relied upon by the Examiner.

Finally, with regard to the new matter rejection of claims 77, 80 and 83, and the new matter rejection pertaining to the softening of the circuit board, it is respectfully submitted that the Examiner's position taken with regard to these issues is not proper and should be withdrawn. In this regard, from a fair reading of the original specification, it is clear that the subject matter of claims 77, 80 and 83 is fully supported by the original specification. Also, from a fair reading of the specification, coupled with the Rule 132 Declaration filed November 18, 2002 it is clear that the softening of the circuit board is also fully supported by the original specification.

In view of the above amendments and remarks, it is respectfully submitted that the present application is in condition for allowance and an early Notice of Allowance is earnestly solicited.

If after reviewing this Amendment, the Examiner believes that any issues remain which must be resolved before the application can be passed to issue, the Examiner is invited to contact the Applicant's undersigned representative by telephone to resolve such issues.

Respectfully submitted,

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39. A method of mounting an electronic component, said method comprising:
aligning in position bumps formed by wire-bonding on electrodes of said electronic component with electrodes of a circuit board, with interposition between said electronic component and said circuit board of insulative solid thermosetting resin;

softening to flow up to an edge of said electronic component, and then hardening,
with heat, said thermosetting resin interposed between said electronic component and said circuit board, while achieving mutual pressing between said electronic component and said circuit board at a pressure of force of at least 20 gf per bump during leveling of said bumps and correcting of any warping of said circuit board, thereby bonding said electronic component and said circuit board together to achieve electrical connection between said mutual electrodes thereof; and

said hardening, said leveling and said correcting being achieved at approximately the same time.

52. A method of mounting an electronic component, said method comprising:
aligning in position electrodes of said electronic component with electrodes of a circuit board, with interposition between said electronic component and said circuit board of insulative solid thermosetting resin;

softening to flow up to an edge of said electronic component, and then hardening,
with heat, said thermosetting resin interposed between said electronic component and said circuit board, while achieving mutual pressing between said electronic component and said circuit board during correcting of any warping of said circuit board, thereby bonding said electronic component and said circuit board together to achieve electrical connection between said mutual electrodes thereof;

wherein, prior to said aligning, said thermosetting resin, in the form of a solid thermosetting resin sheet having holes formed at positions corresponding to said electrodes of said circuit board and extending in a direction of extension of said

electrodes, with particles being embedded and electrically continuous in said holes, said particles comprising resin balls having surfaces plated with gold, nickel particles, conductive particles made of silver, silver-palladium or gold, conductive paste, or gold balls, is applied to said electrodes of said circuit board by positional alignment, and said bonding is executed by said hardening said sheet by application of heat thereto while conducting said pressing by forcing said electronic component toward said circuit board; and

wherein each of said particles has a size greater than a thickness of a passivation film to be coated on at least said electrodes of said electronic component and smaller than a thickness of one of said electrodes of said circuit board, and said bonding further is executed by applying ultrasonic vibrations to said electronic component.

58. An apparatus to mount an electronic component to a circuit board, said apparatus comprising:

a positional alignment device to align in position bumps formed by wire-bonding on electrodes of the electronic component with electrodes of the circuit board, with interposition between the electronic component and the circuit board of insulative solid thermosetting resin;

a heating device to soften to flow up to an edge of the electronic component, and then harden, with heat, the thermosetting resin interposed between the electronic component and the circuit board; and

a pressing device to achieve mutual pressing between the electronic component and the circuit board at a pressure force of at least 20 gf per bump during leveling of the bumps and correcting of any warping of the circuit board, thereby bonding the electronic component and the circuit board together to achieve electrical connection between the mutual electrodes thereof; and

said heating device and said pressing device achieving the hardening of the thermosetting resin, the leveling of the bumps and the correcting of the warping at approximately the same time.